Threat of Entry and Debt Maturity: Evidence from Airlines

Gianpaolo Parise*

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Abstract

This paper provides evidence for a causal effect of the threat of entry on capital structure in the airline industry. Building on the previous literature, the evolution of Southwest Airlines' route network is used to identify routes where the probability of future entry dramatically increases. Empirical results show that when the most strategic route is threatened, incumbents increase the proportion of their long-term liabilities by 13% *before* Southwest starts flying. Conversely, nothing happens when relatively unimportant routes are threatened. Similar results are found using the industry deregulation during the Carter administration as a quasi-natural experiment. Overall, my findings suggest that airlines respond to entry threats by lengthening the maturity of their debt in order to reduce liquidity risk and discourage actual entry.

*Swiss Finance Institute and University of Lugano. Most of this paper was written during my stay at Harvard University. I thank the U.S. Department of Transportation for providing the data. I am particularly grateful to Francois Degeorge, Alexander Eisele, Francesco Franzoni, Robin Greenwood, Victoria Ivashina, Filippo Mezzanotti, Alberto Plazzi, Tom Powers, Giuseppe Pratobevera, Mirco Rubin, Martin Schmalz, Adi Sunderam and participants to the Harvard Business School seminar and the Eurofidai Conference 2014 in Paris for useful comments. I am also grateful to Jeff Gorham at the U.S. Department of Transportation for resolving questions about the data. All errors are solely mine. I acknowledge financial support from the Swiss National Science Foundation and the Swiss Finance Institute. Author contact: gianpaolo.parise@gmail.com

1 Introduction

The financial structure of firms has deep implications for their ability to survive in competitive markets. For instance, a large literature explains that "deep-pocketed firms" will attempt to drive financially constrained competitors out of business (see, e.g., Telser (1966), Fudenberg and Tirole (1986)), while firms operating in "tougher" markets run the risk of not being able to rollover their debt at maturity (Diamond (1991), Brunnermeier and Yogo (2009)). A natural *ex ante* implication of this is that if firms anticipate greater competition in the future, they should seek to adapt their financial structure today. However, empirical support for a causal effect of expected competition on financing choices is scarce at the very best.

This paper documents how the threat of entry affects corporate debt maturity in the context of the American domestic airline industry. The choice of airlines as the main setting for such an analysis is driven by two considerations. First, domestic flights are (relatively) homogeneous products offered in a very competitive market. Second, it is empirically challenging to find a relation between corporate debt maturity and competition. While competition may exhibit a trigger effect, debt and entry choices are endogenously determined and affected by other factors that weaken the empirical relation between the two. A domestic airlines setting provides rich data availability that makes it possible to build an accurate identification strategy.

Specifically, the empirical challenges to be addressed include the following. First, the actual entry into a market is driven, among other things, by the debt structure of the incumbents. There is rich theoretical and empirical[1] support for the notion that

[1]Several papers theoretically derive the prediction that debt has an effect on the intensity of competition. For instance, Bolton and Scharfstein (1990) and Phillips (1991) indicate that high leverage promotes "softer" competition, while Brander and Lewis (1986), Maksimovic (1988), and Rotenberg and Scharfstein (1990) suggest that leverage tilts managerial incentives in a way that leads to "tougher" competition. Empirical work is mostly consistent with the first prediction (e.g., Chevalier (1995); Campello (2003)). However, Khanna and Tice (2000) and Phillips (1995) find more controversial results. Closer to the hypothesis tested in this paper, Glazer (1994) theoretically derives the prediction

highly leveraged incumbents with a relevant portion of their debt to roll over in the near future are less likely to respond aggressively to new entrants, e.g., starting a "price war." Hence, new firms are incentivized to enter markets dominated by firms having large debts with short maturities. At the same time incumbents may lengthen debt maturity as a strategic response to entry. These two opposite effects may lead to biased estimates or cancel each other out when exploring the contemporaneous relationship between competition and debt.

Second, the identification of direct competitors is problematic. Widely used classification standards include Standard Industrial Classification (SIC) codes, the North American Industry Classification Standard (NAICS), and the Global Industry Classification Standard (GICS) system. However, Lewellen (2012) shows that traditional classification methods fail to properly map the product market space[2] (see also Clarke (1989) and Kahle and Walkling (1996) on the shortcomings arising from using standard industry classification methodologies). Furthermore, such identification standards allow for the construction of proxies for competition only at the aggregate industry level. It is, however, an unrealistic assumption that all firms in the same industry are exposed to the same degree of competition. Consistent with this claim, MacKay and Phillips (2005) show that the position of a firm within an industry is much more relevant than between-industry differences in explaining financial leverage.

In the airline industry, domestic flight data collected by the U.S. Department of

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that debt maturity has an impact on market competition, whereas the model proposed by Lambrecht (2001) indicates that financial vulnerability induces earlier entry.

[2]As a general example consider two hypothetical restaurant chains, the first one operating only in New York City and the second only in California. The California restaurant chain will not compete directly with the restaurants in New York City because their customers are located in different states. Hence, the opening of a new shop or a price adjustment will probably have no effect on the policies of the "rival." However, traditional industry classification standards would typically group the two together in a broad "restoration" category. Similarly, two airlines operating in completely different locations would hardly influence one another. For instance, although they belong to the same industry, it is unlikely that the financial decisions of Sierra Pacific Airlines are influenced by the sales of Alaska Airlines, because they do not compete on any single route.

Transportation from 1990 to 2013 make it possible to establish flight routes for each air carrier. In particular, this paper looks at the evolution of the route network of Southwest Airlines, the low cost airline with the greatest expansion over the past 20 years.[3] The focus is on situations where Southwest begins to operate at one endpoint of a route (having already been operating out of the other endpoint), *but before it starts flying the route connecting the two endpoints.*

As an illustrative example, consider Southwest's entry into Washington Dulles International Airport. Southwest began to fly out of Dulles (IAD) in October 2006, with nonstop flights to four cities in its network, and one-stop service to several others. However, upon entering Dulles Airport, Southwest did not immediately start flying on the route Dulles (IAD)-Cleveland (CLE). Cleveland is also a Southwest airport: The airline flew between CLE and other airports, but not the CLE-IAD route. It is reasonable to expect that, after Southwest began to operate at both endpoints of the route, competing airlines would soon realize that the probability of Southwest entering the Dulles (IAD)-Cleveland (CLE) route had risen dramatically (in fact it started to fly the route in 2007).[4]

In particular, when Southwest operates out of both endpoints of a route, the probability that it will enter the route itself the year after is about 14 times greater than when operating at only one endpoint. This paper explores how incumbents' corporate debt maturity changes in response to this threat. I find that when one strategic route is under threat, airlines lengthen the maturity of their debt. Specifically, when the route with the highest passenger traffic is threatened, incumbents increase the proportion of their long-term liabilities by 13% on average. This results is obtained including airline fixed effects and controlling for common predictors of corporate debt maturity. The

[3]Southwest Airlines is now the world's largest low-cost carrier. Figures 1 and 2 show Southwest's airport presence computed from my sample of flight data for the years 1990 and 2013, respectively. The figures clearly represent the airline's dramatic expansion in the last 20 years.

[4]This example and the identification strategy are adapted from Goolsbee and Syverson (2008).

documented effect becomes weaker for routes that are relatively less important for the incumbent. Consistently, when the least profitable routes are threatened, I do not find any change in the liability structure.

The choice of pushing forward the moment at which debt is due is driven by the disruptive effect of Southwest's entry into a route. Using a 10% random sample of all tickets sold by domestic airlines in the last 20 years, I find that when Southwest actually starts flying on a route, average fares charged by all air carriers operating on the same route drop by $12 on average. Additionally, fares charged by the largest air carrier drop by $15 and the market share of the largest incumbent falls by roughly 2% (the average ticket price in my sample is $210 and the median $207, all numbers are adjusted for inflation). This creates a strong incentive for the threatened airlines to adopt preemptive strategies or accommodate to actual entry.

As additional evidence in support of my findings, I exploit a quasi-natural experiment in which the threat of entry comes from an external source: the industry deregulation promoted by the Carter administration. The Airline Deregulation Act had a disruptive effect on the industry: the number of airlines almost doubled in the following years, causing ticket prices to fall sharply. Importantly, the Deregulation Act itself was approved in 1978, but the law was supposed to become effective only four years later (most of the new entrants actually joined the industry during 1981-1983). However, by 1978 it was already clear to incumbents that competition was poised to surge dramatically. Hence, I can develop a difference-in-differences approach that explores the effect of the announcement of growing future competition on corporate debt maturity for airlines that were already operating in the industry. It is important to exclude new entrants from the sample, because the focus is on the change in the liability structure of the incumbents. As a control group I use firms belonging to other (non-air) transportation industries, (e.g., water and tracked transportation and trucking)[5] because they share several similarities with the airline industry in terms of exposure to external shocks (e.g., fuel price or demand for transportation) and profitability. Additionally, average cash flows for such a control group are highly correlated with those of airlines outside of the deregulation period. The effects of expected competition on debt maturity estimated using the difference-in-differences approach are, however, analogous to those found for Southwest's entry threat.

Overall, my empirical findings indicate that incumbents respond to the threat of entry by increasing the proportion of long-term debt that they hold. Conversely, I do not find any significant effect on the stock of debt or on the debt-to-assets ratio. This finding provides insight into the risk management strategy employed by airline companies. A longer debt maturity allows firms to reduce liquidity risk, i.e., the risk that lenders are unwilling to refinance when bad news arrives. Additionally, consistent with the theoretical prediction of Lambrecht (2001), I find that a longer debt maturity has a deterrence dimension. In fact, Southwest is less likely to enter into routes where the incumbent serving most of the traffic has a smaller fraction of its debt due to roll over in the near future and less leverage overall (if I consider average values for *all* incumbents operating on the route instead of only the biggest air carrier, I obtain similar results). This is consistent with the argument that financially flexible incumbents are more likely to respond aggressively to new entrants (see also Bolton and Scharfstein (1990) and Frésard (2010)). Conversely, financially vulnerable firms are less likely to start a price war and can be more easily forced out of the market.

Moreover, using financial reports from public and private airlines provided by the U.S. Department of Transportation, I explore how ownership affects the response of incumbents to the threat of entry. Consistent with the hypothesis that private firms

[5]The trucking industry was deregulated two years later (see Zingales (1998)). However, dropping trucks from the control group leaves the main results unchanged.

experience more difficulties in obtaining external financing (especially when their financial conditions deteriorate) due to asymmetric information, I find that the effect of future competition on debt maturity is significantly stronger for privately held airlines.

This paper contributes to three streams of literature. First, an extensive theoretical literature[6] analyzes the optimal capital structure that firms should adopt to minimize liquidity risk.[7] In particular, Brunnermeier and Yogo (2009) argue that firms should secure long-term financing just before their financial conditions worsen. Long-term debt generally decreases a firm's ability to readjust its maturity structure quickly in response to changes in asset value. However, firms should trade off the costs of liquidity risk, i.e., the possibility of having to seek more expensive sources of financing or liquidate assets at fire sale prices, against the costs of reduced flexibility. Consistent with such a prediction, this paper shows that an increase in the probability of a future negative shock pushes incumbents to substitute short-term with long-term debt *before* the shock actually occurs. My result is also consistent with the evidence from Graham and Harvey (2001)'s extensive survey of 392 financial executives indicating that the cost of refinancing in "bad times" is the second most important factor affecting the decision to issue long-term debt.

Second, a growing literature in finance explores empirically the effect of product market competition on payout policies (Grullon and Michaely (2007)), governance (Giroud and Mueller (2010) and Giroud and Mueller (2011)), innovation (Aghion, Bloom, Blundell, Griffith, and Howitt (2005)), leverage (MacKay and Phillips (2005),

[6]See, e.g., Morris (1976), Diamond (1991), and Brunnermeier and Yogo (2009).

[7]More broadly, a large theoretical and empirical literature explores the determinants of a firm's debt maturity structure. For instance, Myers (1977) argue that firms with more growth options in their investment opportunity sets have less long-term debt in their capital structure to attenuate the "debt overhang problem," while Brunnermeier and Oehmke (2013) show that a firm's maturity choice can be limited due to a rat race among creditors to shorter and shorter maturity. Barclay and Smith (1995), Guedes and Opler (1996), and Stohs and Mauer (1996) test empirically the main theories on maturity choices, while Benmelech (2008) provides evidence on the link between assets' liquidation values and debt maturity.

Banerjee, Dasgupta, and Kim (2008), and Xu (2012)), investments (Akdoğu and MacKay (2008) and Frésard and Valta (2012)), cash holdings (Morellec, Nikolov, and Zucchi (2013), He (2013) and Hoberg, Phillips, and Prabhala (2014)). The paper that is probably closer to mine in terms of its research question is Khanna and Tice (2000). In that paper, the authors study the effect of Wal-Mart's entrance in a local market on incumbents' choice to expand/retreat. However, the effect of competition on corporate debt maturity has not yet been explored. Moreover, all of the above papers look at actual entry or present competition, whereas the present paper explores the effect of the "threat of entry," i.e., it focuses on what happens before actual competition increases.

Finally, this paper speaks to the literature discussing strategic entry deterrence and accommodation. A large debate concerns whether deterrence actually makes sense, since it forces a firm to deviate from its optimal strategy before this is actually needed (i.e., before entry). My empirical finding that incumbents increase the proportion of long-term maturity and that this discourages Southwest's entry is broadly consistent with a series of papers supporting the deterrence argument (e.g., Dixit (1980); Aghion and Bolton (1987); and Milgrom and Roberts (1982)).

The rest of the paper proceeds as follows. Section 2 describes the data used. Section 3 briefly describes the empirical design. Section 4 presents the main results from both the Southwest experiment and the Carter's deregulation. Section 5 provides additional robustness tests. Section 6 concludes.

2 Data

2.1 Form 41 financial data

All airlines in the United States are required to file financial reports (commonly referred to as form 41) including balance sheet, employment data, income statement, fuel cost and consumption, and operating expenses. This study uses data collected by the Office of Airline Information of the U.S. Department of Transportation for the period 1990 to 2013. Airlines operating domestic flights in the United States are also obliged to disclose data about all their flights to the Department. I match airlines' flights to their financial data using the variable "airline ID." The larger sample includes 270 airlines. However, in my analysis I focus only on the domestic segment. Because I do not have data on international flights for non-U.S. companies (e.g., I have Delta flights from New York to London, but I do not have British Airways flights for the same route), including international flights would underestimate competition. Hence, my final sample includes 184 airlines and 67,405 routes.

Importantly, the sample is free from selection bias. The U.S. Department of Transportation makes financial data available for all operating and defunct airlines for the 1990-2013 period. The coverage is more ample than that provided by Compustat, because the latter's dataset includes only public companies. On the contrary, the Department of Transportation collects data for all private and public airlines. In particular, small private firms are more likely to adopt precautionary policies in response to competition according to Morellec, Nikolov, and Zucchi (2013). Their exclusion from the data may therefore lead to rejection of the hypothesis that competition has an effect on debt maturity even if this were true in general. However, form 41 filings include less information than Compustat. For instance, Compustat includes data on long-term debt that matures within two, three, four, and five years, while 41 filings only differentiate between current and long-term liabilities.

2.2 Flight data

Data on flights are obtained from the T-100 domestic market dataset collected by the Department of Transportation. These data have an important conceptual difference with the T-100 domestic segment dataset. The former considers a route to be a "market" on the basis of its origin and destination airports, no matter how many stops occur in between. The latter assumes that every stop breaks the flight into different markets, e.g., flights taking off from Boston Logan (BOS) for destination Santa Barbara (SBA) with one stop in Phoenix (PHX) are considered one market by the T-100 domestic market table, and two completely separate markets by the segment table (i.e., Boston [BOS] - Phoenix [PHX] and Phoenix [PHX] - Santa Barbara [SBA]). In the paper I present results using the first set of data. However, I obtain similar results using the T-100 domestic segment dataset.

Another important distinction is between airports and cities. Computing routes on the basis of airports assumes that two flights taking off from the same airport but landing in two different airports in the *same* city operate in completely different markets. Conversely, computing routes on the basis of cities assumes that travelers are completely indifferent to airports located in the same city. Since Goolsbee and Syverson (2008) find that the threat of entry into an airport has no effect on the fares at another airport located in the same city, the first approach is more consistent with the literature. However, employing the second methodology does not significantly alter the results.

My flight sample is complete in the sense that every single domestic flight that took off in the 24-year period 1990-2013 is recorded. The matching of flight data with airlines' financials is very precise using information provided by the Department of Transportation, because both the financial data sample and the flight sample contain the same unique airline identifier. Manually matching airlines' names from the flight sample with Compustat records would be more complicated because several airlines are reported under slightly different names, changed their names over time or merged. Additionally, all private airlines would be lost.

However, Compustat data are used for the pre-1990 period (i.e., for the deregulation experiment) for which financial data from the Department of Transportation are not available (having been collected only since 1990). Table 1 compares the number of airlines reporting to Compustat and to the Department of Transportation each year.

2.3 Main variables

The main variables of interest considered in my analysis are ***DebtRatio***, computed as total book liabilities over book assets; and a proxy of debt ***Maturity*** computed similarly to Titman and Wessels (1988) as the proportion of non-current debt (the sum of non-current long-term debt, advances from associated companies, pension liabilities, non-current obligations under capital leases, and other non-current liabilities) over total debt.[8] Hence, in my analysis I compare current versus non-current liabilities. It is worth pointing out that current maturities of long-term debt are not included in the numerator of ***Maturity***. Hence, an increase in ***Maturity*** indicates an average increase in debt maturity. Yet non-current long-term debt is the largest part of non-current liabilities. Hence, using as dependent variable just long-term debt over total liabilities as a dependent variable yields similar results.

Other relevant variables considered in my analysis are: ***Size***, computed as the natural log of book assets at the beginning of the year; ***ROA***, computed as net income over book assets in the previous year; ***Passengers***, the natural log of passengers flying with airline i in year t; and ***Fuel***, the log expenses for fuel by airline i in year $t-1$. To ascertain whether it is necessary to use firm-specific shocks in place of industry-wide competition measures, I compute the value-weighted Herfindahl-Hirschman Index (HHI) at the route level:

[8] Titman and Wessels (1988) actually scale long-term debt by total book value or market value of equity. However, the former approach gives similar results, while I do not have the market value of equity to compute the latter. Alternative proxies are computed for the deregulation experiment exploiting Compustat data, e.g., debt maturing in more than two (three, four or five) years over total debt or new long-term debt just issued over total debt.

$$RHH_{r,t} = \sum_{i=1}^{N} s_{i,t}^2, \tag{1}$$

where $s_{i,t}$ is share of flights by airline i, e.g., Southwest Airlines, serving each route r, e.g., Boston (MA) - New York (NY), in year t. On average the most crowded routes are those connecting large cities in relative geographical proximity, e.g., Washington D.C. - New York (NY), Chicago (IL)-Detroit (MI), Philadelphia (PA)-New York (NY), Seattle (WA)-Portland (OR). Conversely, routes connecting distant cities display higher concentration, e.g., until 2004 only one air carrier was operating on the route San Diego (CA)-Kahului (HI).

An airline's HH is obtained by summing route concentrations (RHH) over the routes an airline is actually flying, weighted by the exposure of the airline to such routes. Exposure, w, is calculated as the number of flights for airline $(i{,}t)$ on route r over its annual total number of flights. Therefore, HH is computed as follows:

$$HH_{i,t} = \sum_{r=1}^{R} w_{i,r,t} RHH_{r,t}, \tag{2}$$

Summary statistics for the main variables are reported in Table 1. $sd(HH)$ indicates a high within-industry standard deviation of competition (which is assumed to be zero in most of the related papers). This demonstrates the need for a firm-specific measure of competition. However, using HH as the main independent variable would lead to biased estimates due to reverse causality.[9] Hence, in my analysis I develop a proxy of potential future competition based on Southwest's airport presence.

[9]Several papers show that competition has an effect on financial variables, e.g., Chevalier (1995) shows that product market competition in the supermarket industry becomes softer when leverage increases, while Frésard (2010) argues that cash rich firms gain largest market shares at the expense of their rivals.

3 Empirical Design

Until around 2002 the intersection between Northwest Airlines and Southwest Airlines' flight routes was limited. However, since around 2003 Southwest started to aggressively compete on many routes served by Northwest. As a result, Northwest was forced to make dramatic changes. In the attempt to cut costs, the company went through major employee layoffs; removed pillows, peanuts, pretzels, newspapers and magazines from domestic flights; and "retired" costly and aging aircraft such as the Boeing 727 and McDonnell Douglas DC-10-40. Simultaneously, Northwest's proportion of long-term debt over total liabilities increased by roughly 20% and did not revert back afterwards.

This example suggests that airlines' debt maturity is affected by Southwest's presence. However, a potential effect of debt on entry decisions would bias coefficients estimated by running an OLS regression of corporate debt maturity on Southwest's entry, because Southwest might consider the financial structure of the incumbents before entering a route. In particular, the coefficient estimated running an OLS regression of ***Maturity*** on actual entry is not statistically different from zero, because either the two effects cancel each other out or when Southwest actually enters the route is "too late" to issue long-term debt. To overcome this issue I exploit the fact that airport presence is a strong predictor of actual entry.[10] This relation is particularly robust in the case of Southwest. Figure 3 shows how the identification strategy works in a specific case, while Figure 4 illustrates the evolution of Southwest's routes from 1990 to 2013. The increasing trend of route presence over time is striking. In particular, the low-cost air carrier expanded its network significantly in my sample period, and once Southwest starts operations at both airports of a route, the probability that it will start to fly the

[10]Empirical work that has shown that endpoint airport presence is correlated with entry includes Berry (1992), Peteraf and Reed (1994) and Goolsbee and Syverson (2008), while Bailey (1981) describes a case where this approach was used in antitrust policy. More broadly, the importance of airport presence is stressed in Borenstein (1989) and Borenstein (1990).

route itself soon enough rises abruptly.

I run probit regressions for the probability of Southwest's actual entry into a route in year $t+1$, conditional on its presence at either only one endpoint of the route or both endpoints in year t. The sample of all possible routes is obtained from flight data.[11] The marginal probabilities are reported in Table 2 (time fixed effects are included and errors are clustered at the route level). Presence at both endpoints increases the probability of entry in the following year by 28%, about 14 times the probability of entering a route when Southwest operates only at one endpoint of the route. Hence, incumbents can easily deduce that they will have to face Southwest's competition soon, even though Southwest has not actually decided to enter the route yet.

Another consideration to account for in the empirical analysis is that incumbents operate on several routes. Hence, the threat of entry into a route with high traffic will probably have a different impact than a threat to an unimportant route. To assess the relative importance of a route, I use data on the number of passengers that traveled each route in a given year for each airline and I rank the routes based on airlines' traffic. Hence, I run the following regression:

$$Maturity_{i,t} = \beta(ThreatOfEntry_{i,k,t}) + \gamma' X_{i,k,t} + \theta_t + \vartheta_i + \varepsilon_{i,t}, \tag{3}$$

where $ThreatOfEntry_{i,k,t}$ is a dummy variable that takes a value of one when Southwest starts to operate at both endpoints of at least one of the k most important routes for incumbent i (but *not* on the route itself), in year t and takes a value of zero other-

[11]Following Goolsbee and Syverson (2008) I consider as potential routes only those where Southwest eventually enters. This approach rules out routes where Southwest will never realistically enter. If I consider as potential routes all the routes in my sample, I would get estimates of 0.0019 and 0.0799 for the marginal probability of entry when Southwest has single and double airport presence, respectively (i.e., the probability of entry with double airport presence would be about 40 times bigger). For the purposes of this paper the exact probability of entry is however irrelevant. The only necessary conditions for my identification strategy to hold are that entry when Southwest operates at both endpoints of a route is significantly more likely and that this is known by incumbent airlines.

wise. In my regressions $Maturity_{i,t}$ is the main financial variable of interest, θ_t and ϑ_i are time and airline fixed effects and time-varying controls for airline i and year t are included. It is important that both time and airline dummies are included to account for time-invariant airline heterogeneity and time trends. Errors are clustered at the airline level.[12]

As a further exogenous source of variation in competition, I look at the change in the regulatory environment. Before the 70s the Civil Aeronautics Board (CAB) had control over fares, routes, and schedules for all interstate domestic air transport. In particular, the CAB had to ensure the airlines a positive rate of return and restrict entry to prevent destructive competition. Conversely, airlines that flew only on intrastate routes were regulated by the state in which they were operating. Over time this system resulted in fares above efficient levels and, in general, an inefficient market for air transportation (see Bailey (1986)).

The mid-1970s witnessed a drastic transformation of the industry. Hearings held by Senator Edward Kennedy's Judiciary Committee in early 1975 emphasized the costs and inconsistencies of CAB regulation, and pushed airline regulation onto the national agenda. Finally, President Carter signed the Airline Deregulation Act into law in October 1978. The act was designed to "amend the Federal Aviation Act of 1958, to encourage, develop, and attain an air transportation system which relies on competitive market forces to determine the quality, variety, and price of air services."

[12]In principle $ThreatOfEntry$ could be computed for each airline network, i.e., I could study the reaction of incumbent i to airline j's threat of entry. However, there are some limitations. First, the network expansion of other airlines is definitely slower than Southwest. Hence, the probability of entry in the following year given airport presence is much lower. Second, the price impact of actual entry is different. For instance, Southwest's entry into routes operated by Northwest had a significant impact on Northwest's profitability. However, how relevant Northwest's entry would be into routes served by Southwest is debatable. Finally, several airlines have codeshare agreements that limit actual competition. However, Southwest does not participate in any strategic alliance with the sole exceptions of the codeshare agreements with ATA Airlines and AirTran Airways. Consistent with the liquidity risk hypothesis, dropping such airlines from my sample improves the results.

The impact of deregulation on the industry was pervasive.[13] Entry boomed, fares have fallen by half in real terms in the last two decades, a number of historical companies have been liquidated (e.g., Braniff, Eastern, Pan American), others (e.g., Continental, Northwest, United, US Airways and Delta) have used the bankruptcy code one or more times (Bailey, Graham, and Kaplan (1985), Borenstein (1992)). According to Bob Crandall, former president and chairman of American Airlines, the industry was until few years ago in "a complete state of disrepair".[14]

In my analysis I look at the marginal effect of the announcement of the deregulation law on debt maturity $before$ even a single new firm enters the industry. The shock to competition is exogenous and affects to a different degree all routes. Hence, I am going to specify a model similar to (3), where $ThreatOfEntry$ is replaced with $Treatment$, i.e., a dummy variable that takes value of one for airlines from 1978 (the year when the law was passed) onward:

$$Maturity_{i,t} = \beta(Treatment_{i,t}) + \gamma' X_{i,t} + \theta_t + \vartheta_i + \varepsilon_{i,t}, \quad (4)$$

The control group includes other transportation industries since they share several similarities (in average size, profitability and demand) with the airline industry. In particular, the cash flow structure of the two groups $outside$ of the deregulation experiment is very similar.

[13]See Moore (1986) for an analysis of the effects of deregulation on the airline industry. See Zingales (1998) for a description of the company mortality rate in the trucking industry after a similar deregulation law.

[14]"In the land of free flight" The Economist - June 14th 2007.

4 Main Results

This section presents the main empirical results of the paper. The first part addresses the channel through which debt maturity is affected. Sub-section 2 and 3 present results for the Southwest and the deregulation experiments, respectively.

4.1 Entry and route profitability

To understand why incumbents should respond to the threat of entry, I first have to document what are the effects of actual entry in my sample. To do so, I exploit the Domestic Airline Consumer Airfare Reports issued by the Department of Transportation. Average fares are computed using data from the Bureau of Transportation Statistics' Passenger Origin and Destination (OD) Survey, a 10% random sample of all airline tickets for U.S. carriers, excluding charter air travel. Fares are based on the total ticket value, which consists of the price charged by the airlines plus any additional taxes and fees levied by an outside entity at the time of purchase. Fares include only the price paid at the time of the ticket purchase and do not include other fees paid at the airport or onboard the aircraft. Averages do not include frequent-flyer or "zero fares" or a few abnormally high reported fares. The inflation adjustment is calculated using dollars for the most recent year of air fare data.

Southwest's entry into a route has a disruptive effect.[15] Table 3 shows coefficients estimated running OLS regressions of ticket prices on a dummy variable that takes value one when Southwest actually enters into a route and zero otherwise. More precisely, the dependent variables are, respectively: the average fares charged on the route in the

[15]The effects of Southwest's entry on prices are well known (see, e.g., Morrison (2001). More generally, there is consensus concerning the notion that competition hurts firms' profitability (Tirole (2010)) and increases the riskiness of firms' cash flows (Raith (2003); Gaspar and Massa (2006); Irvine and Pontiff (2009)). The purpose of the regressions in Table 3 is simply to show that with the particular design adopted by this paper, incumbents have an incentive to adjust to Southwest's entry.

last quarter of the year, the fares charged by the largest carrier operating on the route, the fares charged by the lowest-fare carrier, and the market share of the largest carrier (measured from 1 to 100). In my regressions I include time and route fixed effects, I control for the average number of passengers per day that flew on the route, and I cluster errors at the route level.

It seems clear that Southwest's entry has a dramatic effect on the profitability of the incumbents. Average fares drop by $12, fares charged by the largest carrier drop by $15 and by $11 for the lowest-cost carrier, while the average ticket price in my sample is $210 and the median is $207. Additionally, the market share of the largest carrier operating on the route drops by roughly 2%. The variable ***Passengers*** is negatively correlated with ticket prices, since it is proportional to the number of planes that are operating on the route. Reverse causality here does not seem to be an issue, since it does not make sense for Southwest to enter the ***least*** profitable routes (i.e., those where average fares are lower). Such a strong effect of Southwest's entry on route profitability proxies suggests that airlines should try to preempt entry or, at the very least, to increase their financial flexibility in order to reduce liquidity risk.

4.2 Threat of Entry and Debt Maturity

Firms borrow short-term for adjusting their capital structure to changes in the maturity of their assets more quickly (Brunnermeier and Yogo (2009)), to attenuate the "debt overhang problem" (Myers (1977)), because a rat race among lenders push them to shorter and shorter maturity (Brunnermeier and Oehmke (2013)), or to signal to the market that they are underpriced (see, e.g., Flannery (1986)). However, failure to rollover debt may lead to relatively higher costs, e.g., seeking for more expensive sources of financing, sell assets at fire sale prices,[16] or renegotiation costs. Hence, airlines under

[16] See Pulvino (1998) for an assessment of fire sale costs in the airline industry.

the threat of entry are potentially better off borrowing long-term to reduce liquidity risk costs.

Table 4 looks at the effect of the threat of entry on corporate debt maturity. In my regressions I investigate whether such a threat also affects the debt-to-asset ratio to rule out the possibility that an increase in maturity is simply due to the fact that the incumbent does not roll over short-term debt that matures in the present year. Importantly, the threat of entry probably has a different relevance for routes that have different importance. For instance, when an airline is operating on many routes presumably a threat to the least profitable route will trigger a different reaction than a threat to the most remunerative one. To measure route importance, I rank every route on the basis of the number of passengers transported by each air carrier in each year. The ranking needs to take into account the fact that airlines have different exposure to the same route, e.g., an air carrier would not care about a threat to a route with high traffic as long as it does not fly it (or derives only a limited fraction of its profits from the route).

In particular, the dummy variable $ThreatOfEntry$ will take a value of one when the route with the highest traffic for airline i, in year t is under threat (column 1), or at least one of the 2, 3, 5, or 10 most important routes is under threat (respectively columns 3, 5, 7, and 9). In my regressions I include time and airline fixed effects, and following Barclay and Smith (1995), Guedes and Opler (1996), and Stohs and Mauer (1996) I control for common predictors of corporate debt maturity such as *Size* and profitability (*ROA*). I do not include variables that proxy for the term structure of interest rates, since I am explaining the cross-sectional variation of airlines' debt maturity and reference interest rates would be equal for all observations during the same year (i.e., the effect of the term structure is captured by the time fixed effects). Similarly, I do not control for industry-level variables since all airlines belong to the same industry. Errors are clustered at the airline level.

Coefficients indicate that *ThreatOfEntry* increases the average proportion of non-current debt maturities by 13% (t-statistic of 2.54) when the most important route is under threat. The effect is respectively 13% (t-statistic of 3.37) when at least one of the two most important routes is threatened, 10% (t-statistic of 3.17) when at least one of the three most important routes is threatened, and 6% and 5% for 5 and 10 routes. Importantly, the effect dies out when routes with less traffic are threatened. I do not find any statistically significant effect of *ThreatOfEntry* on the debt ratio.[17]

Table 5 shows counterfactual effects for the *least* important routes of the incumbent airline (i.e., those with the lowest traffic). The effect of a threat to unimportant routes is not statistically different from zero. This finding confirms the hypothesis that incumbents change their liability structure only when their most important markets are threatened. Additionally, the results reported in column 4 are obtained by replicating the regression of *Maturity* on *ThreatOfEntry* when at least one of the top three routes is threatened,[18] including additional control variables such as cash holdings, the log of the total expenses for fuel, and the number of passengers per airline-year. The results remain unchanged.

The results presented above suggest that incumbents increase the maturity of their debt when their profitability is threatened. This result finds ample support in the literature on risk management and precautionary policies suggesting that firms should adapt their policies to a riskier environment (see Morris (1976); Diamond (1991); and Graham and Harvey (2001)). In particular, Brunnermeier and Yogo (2009) predict that

[17] This finding is potentially puzzling. Even though major capital structure theories do not predict an effect of competition on the debt ratio, firms under the threat of more competitive pressure would probably benefit from owning less debt. In fact, low-leveraged companies are more likely to survive an increase in competition (Zingales (1998). A potential explanation consistent with this finding is that reducing leverage would be too expensive and would compromise even more the survival chances of the incumbent when competition actually increases. Another plausible explanation is that debt in the airline industry is heavily collateralized making firms less flexible.

[18] The results for the top one, two or five routes are similar.

firms should issue long-term debt before their financial condition worsen to minimize liquidity risk. Consistent with their theoretical model, airlines exposed to the threat of entry significantly reduce the proportion of debt that they will have to refinance in the next year when (potentially) Southwest's entry will decrease their profitability. However, the choice of increasing the average maturity of debt may also have a strategic dimension. A large literature documents that high leverage leads to softer product market competition (see, e.g., Chevalier (1995); Khanna and Tice (2000); and Campello (2003)). Hence, it is convenient for new entrants to choose markets where incumbents are more financially vulnerable in order to avoid price wars. Similar to low leverage, a longer maturity of debt provides the incumbent with "ammunitions" to fight against new competitors. In particular, the choice to push forward the moment at which the firm actually needs to roll over the debt allows the firm to be less cash flow dependent when competition increases (and cash flows are lower).

In Table 6 I explore the probability of Southwest entering a route conditional on the maturity of debt of the incumbent serving the largest fraction of the traffic on the route (results for the average maturity of all the incumbents flying on the route are analogous, see section 6). In particular, I estimate probit regressions in which the dependent variable is a dummy that takes value of one when Southwest actually enters a route. Consistent with preemption, Southwest is less likely to enter a route where the *Maturity* of the incumbent is high. The magnitude of the effect of *Maturity* on *Entry* is about 70% of that of the debt ratio. The other control variables have the expected signs: Southwest is more likely to enter into routes where traffic and leverage of the incumbents are high.

Overall, this section shows that the maturity of debt has a strategic dimension and helps incumbents to both discourage and "accommodate" to new competition. This finding adds to previous theories that explain corporate debt maturity as influenced by firm's size, regulatory environment, quality, credit risk, as well as the term structure of interest rates (Barclay and Smith (1995)).

4.3 Quasi-Natural Experiment: Carter's Deregulation

A major econometric issue when studying the effect of competition on corporate variables is reverse causality. In particular, incumbent firms' policies may cause competitors' entry/exit. Ideally, one would wish the change in competition to occur randomly and to look at its effect on firms' decisions. Unfortunately, this is seldom the case in reality. A feasible approach, however, is to exploit an exogenous increase in competition to investigate the effect on financial policies.

The Airline Deregulation Act can serve as such an exogenous shock (provided that the decision to enact the law was not directly or indirectly motivated by airlines' debt structure). There is general agreement that the deregulation decision had a dramatic effect on the industry. In the first decade after the law was passed the average domestic revenue per passenger-mile declined by 2% per year in real terms. Several new carriers entered the market, and many (both new entrants and incumbents) exited the business as well. At present only six of the original carriers operating pre-deregulation are still in business. Airline deregulation was part of a larger project of liberalizations, involving several industries such as trucking, natural gas, and banking, among others (Joskow and Rose, 1989; Joskow and Noll, 1994). This consideration partially alleviates the concern that the deregulation decision is somehow correlated (directly or indirectly) with the specific debt maturity structure of the airline industry. Moreover, according to the related literature the decision to allow new entrants into the business was mainly driven by the desire to lower fares and increase the number of flights.

The bill was passed and signed into law by President Carter on October 24, 1978. Among the stated goals of the act were: "the avoidance of unreasonable industry concentration which would tend to allow one or more air carriers to unreasonably increase prices, reduce services, or exclude competition", "the encouragement of entry into air transportation markets by new air carriers and the continued strengthening of small air carriers" and "placing maximum reliance on competition in providing air transportation services". The Act intended for various restrictions on airline operations to be removed over a period of four years, with complete elimination of restrictions on domestic routes and new services by December 31, 1981, and the end of all domestic fare regulation by January 1, 1983.

In practice, changes came rather more rapidly than that. Figure 5 depicts the number of different airlines in the industry per year. Most of the newcomers entered the industry from 1980 to 1983. After 1983 the number of competitors in the industry first stabilizes and then gradually starts to decline. Data for the number of airlines are obtained from Compustat and therefore include only public air carriers (hence, they potentially underestimate competition). In my analysis I consider the "treatment date" to be 1978, i.e., the year when the law was passed. In fact, it is reasonable to assume that since 1978 it was already clear to all market participants that competition was going to increase in the industry. In particular, my sample includes observations 8 years before and after 1978, since after that time the number of airlines in the industry started to decrease again due to the high mortality rate. However, using 5 or 10 years instead of 8 or collapsing observations before and after 1978 (see Bertrand, Duflo, and Mullainathan (2004)) gives similar results.

Because all airlines receive the treatment, I use as control group all firms operating in the transportation industry that are not airlines, e.g., trucking, tracked (e.g., railroads), and on water transportation.[19] Such companies are subject to similar shocks and share

[19]Results are presented for all firms with a first digit of the SIC code equal to 4. However, results are replicated using a more precise identification, i.e, SIC codes from 4011 to 4799 broadly identify firms closely related to the transportation business. I exclude, however, pipelines (SIC code 4610) because they share few similarities with the airline industry and, in particular, their average financials for the

to some extent a similar consumer demand with the airline industry. Additionally, the two groups are comparable according to several dimensions such as average size, profitability and cash flow structure (summary statistics for the treatment and control group are compared in the Appendix). In unreported results I find the correlation between average cash flows in the airline industry and in the control group to be around 70% ***outside*** of the experiment period, while correlation drops dramatically in the period following the deregulation. This suggests that (apart from the deregulation) the airline industry and the rest of the transportation industry are indeed exposed to similar demand and risk factors.

A potential issue with the control group, however, is that also the trucking industry was deregulated two years later (see the Motor Carrier Act of 1980). Hence, I replicate the difference-in-differences regressions also excluding the trucking industry from the control group[20].

Importantly, for this part of my analysis I use Compustat data since I do not have form 41 filings from the Department of Transportation for this period. All incumbents that were operating in the air transportation industry are included in the treatment group under the condition that they were already reporting to Compustat in 1977, to rule out the possibility that my findings are driven by the financial structure of new entrants. Hence, ***Treatment*** is a dummy variable that takes a value of one for airline incumbents from 1978 onward. Figure 6 shows the evolution of cash flows around the deregulation announcement for airlines and other transportation firms. It seems clear that cash flows significantly dropped in the airline industry after 1978 and recovered

period I consider in my analysis are quite different from the treatment group. Results obtained using these two different control groups are similar.

[20]Furthermore, the American railroad Industry was deregulated in 1980 with the Staggers Rail Act. However, this act did not increase competition in the industry (in particular, the number of firms in the industry does not change in the following years). Hence, in the results presented in Table 7 the railroad industry is not excluded. However, in unreported results I replicated my analysis by excluding it from the sample. The results remain unchanged.

after the entry rate began to decrease again.

In my regressions I include time and firm fixed effects, and I replicate my analysis by clustering errors either at the time or at the firm level. Results are presented for firm clustering, since this yields the largest standard errors. Time-varying controls for size and profitability are included as well. The trend of ***Maturity*** over time (see Figure 7) excludes the possibility that the increase in debt maturity started before 1978. Interestingly, ***Maturity*** was decreasing on average both for airlines and other transportation firms before 1978. The proportion of long-term debt for airlines does not revert back in the eight years after 1978. Results in Table 7 indicate a strong causal effect of competition on ***Maturity*** but no effect on ***DebtRatio***. In particular, the incumbents' proportion of long-term debt increased by 6% when the law was passed. This effect is slightly weaker than that found for Southwest's threatening the main routes. However, the actual effect on prices was still uncertain at the date of the announcement, as it was unclear which routes would experience the greatest increase in competition. Moreover, several new companies entering the industry were small and not financially flexible. Overall, the results in this section are broadly consistent with findings obtained using the main empirical design.

However, a potential alternative explanation for a change in the maturity of debt triggered by the deregulation is provided by the contracting-cost hypothesis. Myers (1977) argues that firms with several growth options in their investment set experience a conflict between stockholders and bondholders over the exercise of these options. Myers proposes three main solutions to this incentive problem: less debt, restrictive covenants in the indenture agreements, or shorter debt maturity. In particular, when the debt matures before the opportunity to exercise the growth option expires, the disincentive to invest is eliminated. Related to this point, Smith (1986) claims that managers of regulated firms have less discretion over future investment decisions than managers of unregulated firms. This reduction in managerial discretion reduces the adverse incentive effects of long-term debt. Hence, the contracting-cost hypothesis would imply that regulated firms will have longer-maturity debt than unregulated firms (see also the discussion in Barclay and Smith (1995)).

However, the above argument would predict an increase of short-term debt triggered by the deregulation[21] (i.e., a decrease in the maturity of corporate debt). Conversely, I find that debt maturity significantly increases for the airline industry as an effect of the deregulation. This appears to be inconsistent with the contracting-cost hypothesis and suggests that for the airline industry debt maturity is mostly explained by the willingness to reduce liquidity risk and discourage entry.

5 Robustness

This section provides additional support for the main findings. Table 8 replicates the OLS regressions of $Maturity$ on $Treatment$ and controls using different proxies for $Maturity$, i.e., long-term debt minus debt maturing within two years scaled by total debt, long-term debt minus debt maturing within three years scaled by total debt, long-term debt minus debt maturing within four years scaled by total debt, long-term debt minus debt maturing within five years scaled by total debt, newly issued long-term debt scaled by total debt. The results remain unchanged.

A potential issue with the main empirical design, i.e., regressing $Maturity$ on $ThreatOfEntry$, is that Southwest may threaten some of the k top routes of an incumbent *and* enter some other top routes at the same time. If this is the case the effect on $Maturity$ may not be driven by the threat of entry but by actual entry. To rule out this possibility Table 9 replicates Table 4 by dropping incumbents that are affected by Southwest's

[21] This assumes that the positive effect of deregulation on investment opportunities given by greater managerial discretion is stronger than the negative effect driven by increasing competition.

entry in at least one of their k top routes in terms of traffic. However, this has no significant effect on the results.

Finally, Table 10 explores the preemption motive of long-debt maturity with a different empirical design. Regressions in Table 6 have, on the right-hand-side, the financials of the largest incumbent operating on the route. Table 10 computes average values for *all* incumbents operating on the route in the previous year. This empirical design would be more convincing in the event that Southwest considers the financial situation of *all* incumbents operating on a route before entering. However, the results remain unchanged.

Table 11 shows results for the threat of entry on ***Maturity*** and ***DebtRatio***, respectively, for privately and publicly held airlines. The statistical significance is lower since the sample is split in two. However, it is evident that the incentive to increase debt maturity is stronger for private airlines because their costs of financing are higher due to asymmetric information. Hence, when their financial conditions deteriorate they are more likely to experience difficulties in rolling over or paying back their debt and benefit more from postponing the maturity date.

6 Conclusion

The effect of competition on economic variables has been extensively debated. Several papers have shown that the competitive environment has major implications for corporate policies, and both empirical and theoretical work claims that the financial structure of firms influences how competition evolves. This paper looks for a causal effect of expected competition on financing choices. More specifically, the question addressed by this paper is whether firms react to the threat of competition by increasing corporate debt maturity.

The setting of this paper is the U.S. domestic airline industry. Today the role of competition has important implications, especially for airlines since the industry is becoming increasingly concentrated due to mergers, e.g., Delta-Northwest (2009), United-Continental (2010), Southwest-AirTran (2011), American Airlines-US Airways (2013) as well as alliances and codeshare agreements between companies that were competitors in the past.

However, airlines have some attractive features that make it possible to build a more precise identification strategy than similar studies based on Compustat firms, and potentially to generalize some of the findings to other sectors. The largest part of the literature on competition focuses on broad proxies of industry sectors to identify competing firms and generally assumes that all firms within an industry are exposed to the same level of competition or to the same shocks. However, MacKay and Phillips (2005) indicate that most of the financial structure of firms is explained by within-industry differences. Additionally, a related literature looks at the effect of actual competition on corporate variables and not at the "threat" of future competition, running potentially into identification issues.

This paper proposes an identification strategy based on the threat of competition posed by Southwest's network expansion and Carter's industry deregulation, while it exploits data on flight routes to identify which airlines are actual competitors within the airline industry. I find competition to have strong implications for the maturity of corporate debt. Airlines exposed to tougher future competition increase the proportion of non-current liabilities to reduce liquidity risk and discourage new entrants from competing directly with them. Overall, my findings support the claim that financial structure has deep implications for the competitive environment and suggest that also potential future competition is considered when firms make financing choices.

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Figure 1: Southwest's airport presence at the end of 1990. When Southwest operates in multiple airports located in the same city only one marker is shown.

Figure 2: Southwest's airport presence at the end of 2013. When Southwest operates in multiple airports located in the same city only one marker is shown.

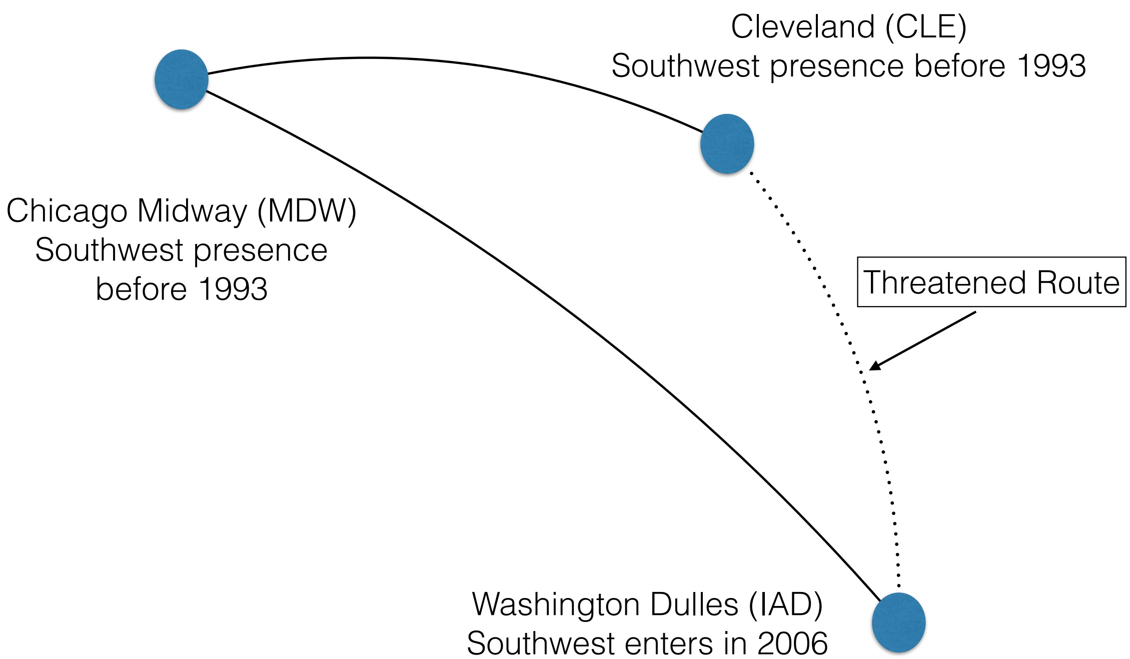

Figure 3: Identification strategy: when Southwest operates at both endpoint airports of a route but not yet on the route itself the route is considered under threat since the probability of entry in the following year gets 40 times greater. For instance, Southwest started to fly from Dulles (IAD) on October 2006, with nonstop flights to four cities in its network, and one-stop service to several others. However, upon entering Dulles Airport, Southwest did not immediately start flying on the route Dulles (IAD)-Cleveland (CLE). Cleveland is a Southwest airport: the airline flew between CLE and other airports, just not the CLE-IAD route. It is reasonable to expect that, after Southwest starts to operate at both endpoints of the route, competing airlines will soon realize that the probability of Southwest entering the Dulles (IAD)-Cleveland (CLE) route has risen dramatically.

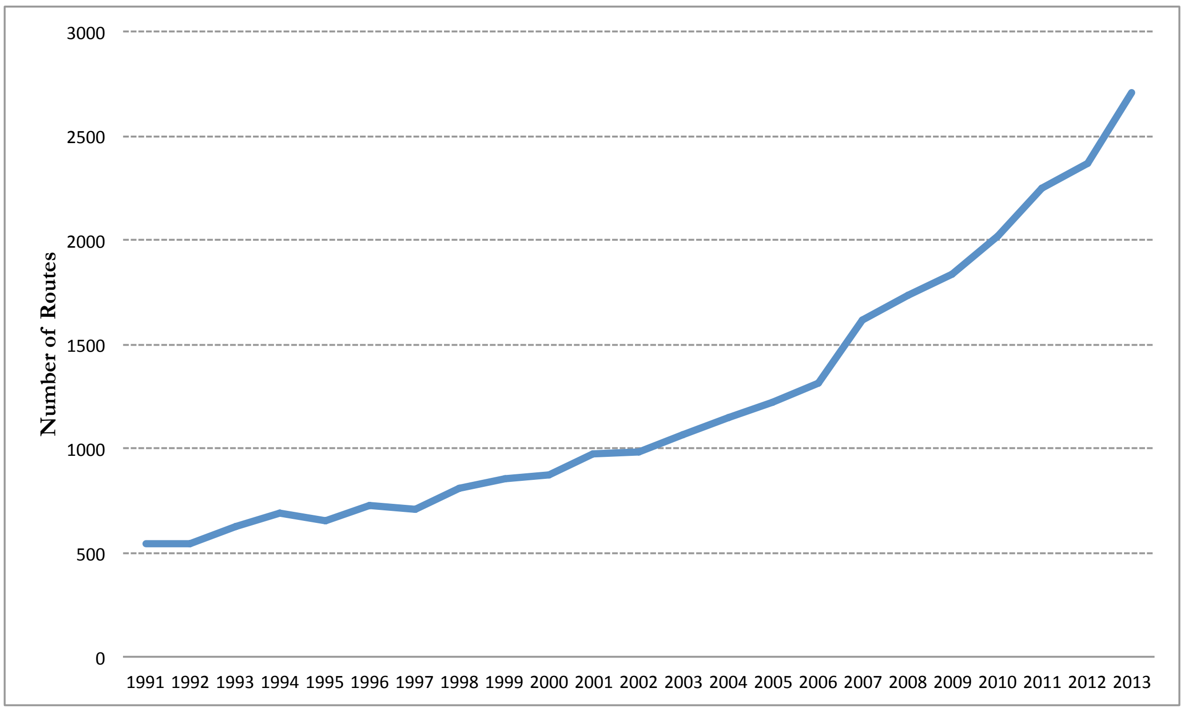

Figure 4: Number of different routes served by Southwest over time. Routes are defined as flight connections from the origin airport to the destination airport. Different airports located in the same city are considered different markets. Different segments (e.g., if one trip needs one or more stops to reach the destination airport) are not considered different markets. Routes are obtained from the T-100 Domestic Market database collected by the U.S. Department of Transportation.

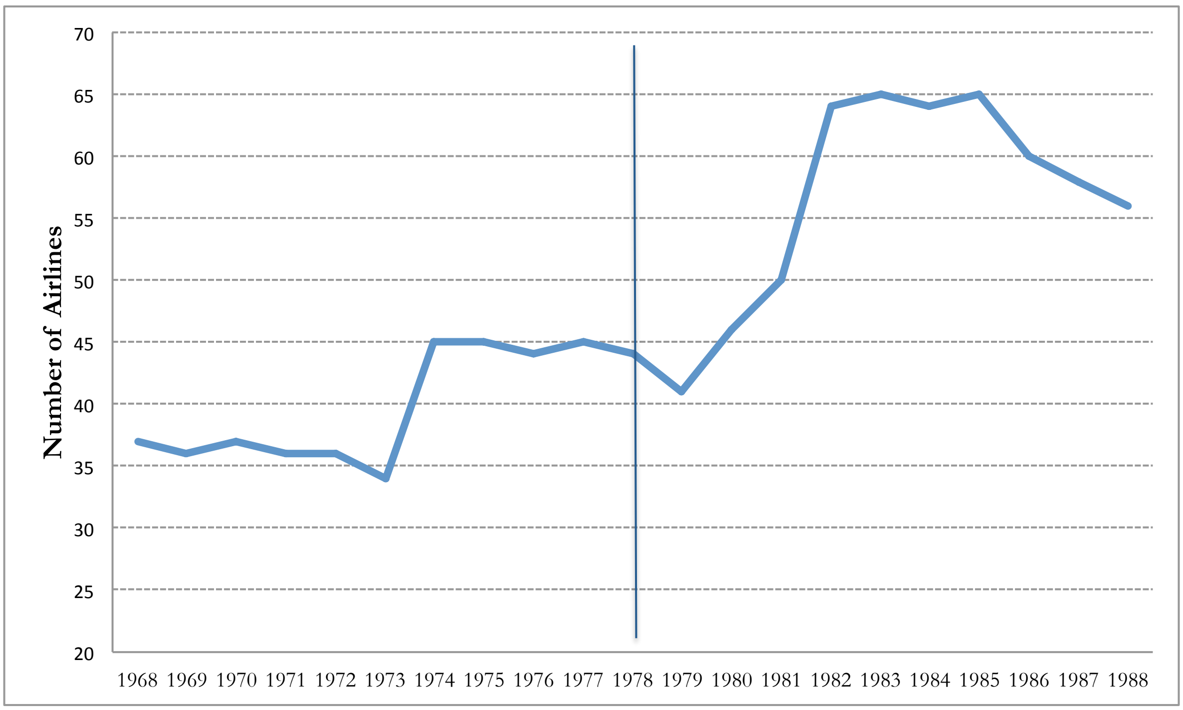

Figure 5: Number of Airlines in the industry around the Deregulation Act. The bill was passed and signed into law by President Carter on October 24, 1978 (see vertical line). Among the stated goals of the act were: "the avoidance of unreasonable industry concentration which would tend to allow one or more air carriers to unreasonably increase prices, reduce services, or exclude competition", "the encouragement of entry into air transportation markets by new air carriers and the continued strengthening of small air carriers" and "placing maximum reliance on competition in providing air transportation services". The Act intended for various restrictions on airline operations to be removed over four years, with complete elimination of restrictions on domestic routes and new services by December 31, 1981, and the end of all domestic fare regulation by January 1, 1983. However, new airlines started to enter the industry approximatively two years after the law was approved.

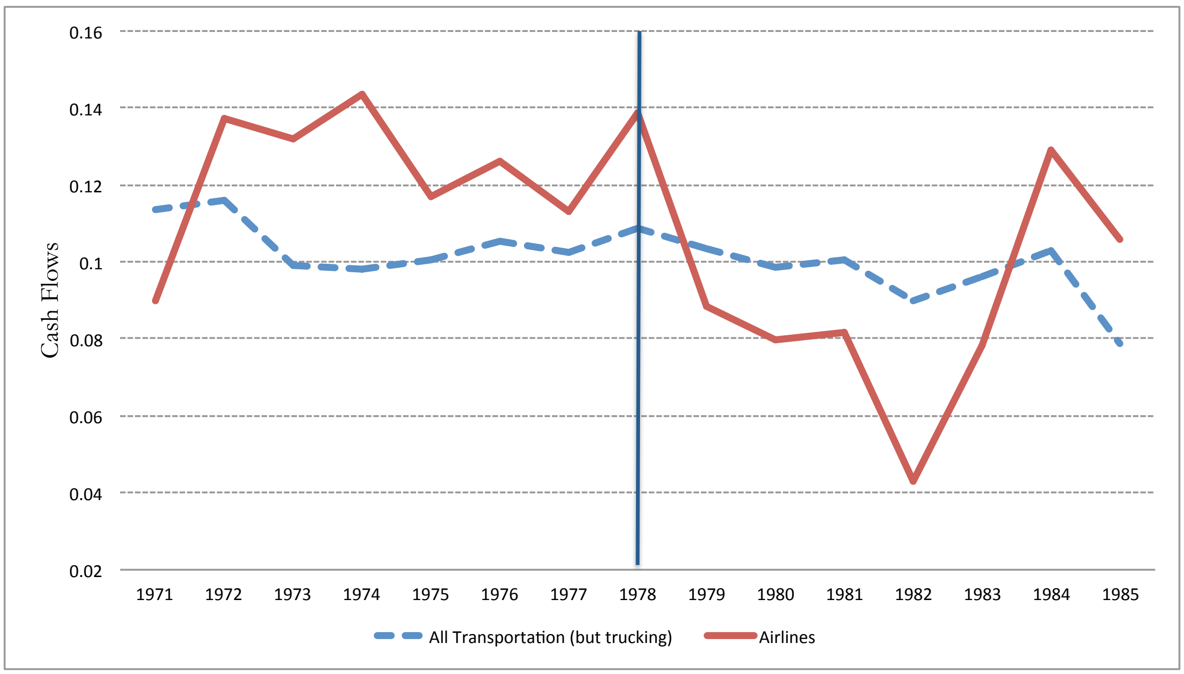

Figure 6: Evolution of *CashFlows* around the industry deregulation (deregulation experiment). *CashFlows* are computed as EBITDA minus taxes, interests and dividends over book assets. The red straight line shows average values for the airline industry. The blue dashed line for all other transportation industries excluding trucking. The Deregulation Act was passed in 1978 (see vertical line). Airlines that entered the industry after 1977 are not considered. Variables are obtained from Compustat.

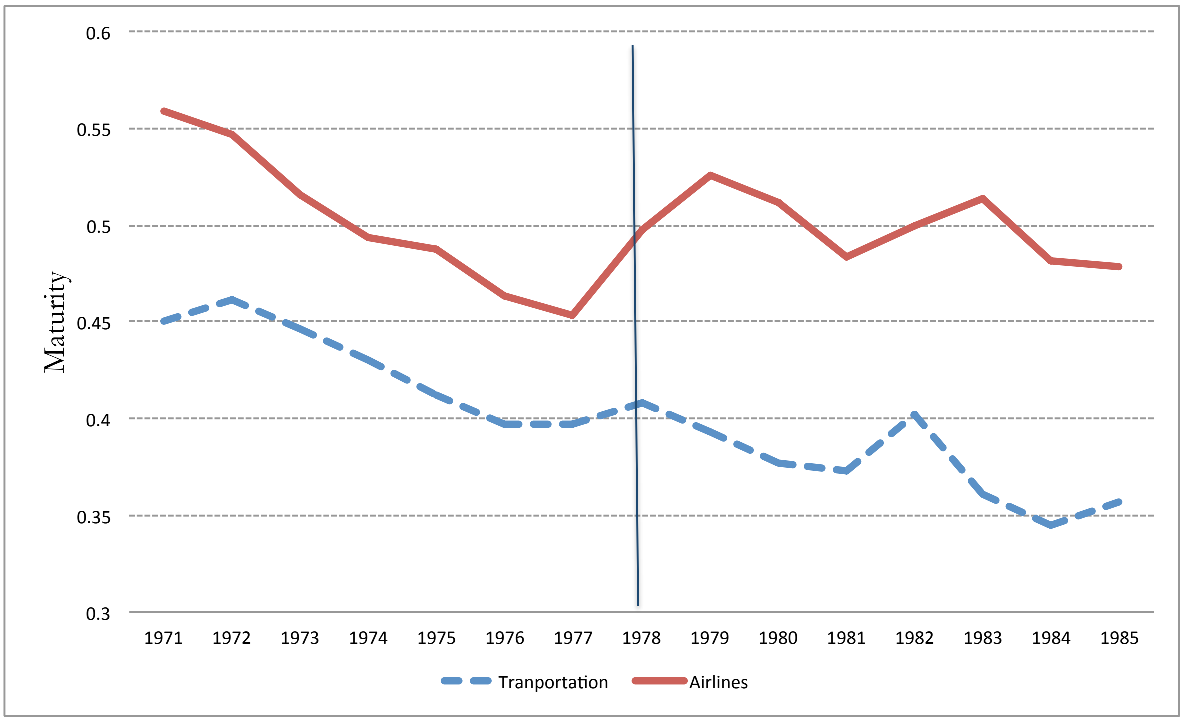

Figure 7: Evolution of ***Maturity*** around the industry deregulation (deregulation experiment). ***Maturity*** is computed as non-current liabilities over total liabilities (see Section 2 for details). The red line shows average values for the airline industry. The blue dashed line shows average values for all other transportation industries. The Deregulation Act was passed in 1978 (see vertical line). Airlines that entered the industry after 1977 are excluded from the sample. Variables are obtained from Compustat.

Table 1: Summary statistics

This table presents annual averages for the book value of airlines' assets (in thousand dollars), the number of routes threatened by Southwest, the corporate debt maturity in the industry computed as Non-current debt over total debt (*Maturity*), HH (defined as in Section 2), the standard deviation of HH, and the number of airlines reporting to the Department of Transportation. The source of data is airlines' form 41.

Year	Assets	Threatened Routes	Maturity	HH	sd(HH)	Airlines (form 41)
1990	1325969	.	0.4671	0.5866	0.1806	51
1991	1335504	56	0.4557	0.6328	0.1749	54
1992	1309390	51	0.4180	0.5843	0.1910	58
1993	1264879	30	0.4420	0.5595	0.1899	65
1994	1087640	194	0.3899	0.5663	0.1819	75
1995	1114165	146	0.3827	0.5884	0.1714	74
1996	1046574	132	0.4075	0.6084	0.1703	80
1997	1364824	90	0.4518	0.6026	0.2022	74
1998	1566533	82	0.4594	0.6016	0.1833	70
1999	1723236	203	0.4405	0.5877	0.1837	72
2000	1902336	66	0.4377	0.5890	0.1886	72
2001	2259324	85	0.4794	0.6038	0.1714	66
2002	2105085	297	0.4680	0.5405	0.1482	76
2003	2142524	375	0.4542	0.4916	0.1193	78
2004	2040336	272	0.4653	0.4743	0.1363	81
2005	1988494	315	0.4840	0.4649	0.1359	84
2006	2063900	269	0.5000	0.4652	0.1485	87
2007	2462610	83	0.5200	0.4684	0.1529	84
2008	2317100	52	0.5272	0.4878	0.1372	80
2009	2378915	155	0.5011	0.4910	0.1371	79
2010	2636618	129	0.4315	0.4626	0.1503	75
2011	2698188	112	0.4065	0.4575	0.1523	71
2012	2860486	220	0.4022	0.4770	0.1637	71
2013	3262327	307	0.4121	0.4807	0.1538	66
Total	1947611	3716	0.4509	0.5320	0.1729	184

Table 2: Probability of Southwest's Entry

This table presents the results from a probit regression in which the dependent variable takes the value of one if Southwest entered into a route in a particular year conditional respectively on Southwest operating at only one endpoint airport of that route in the previous year, or operating at both endpoint airports. The coefficients represent marginal effects. The routes considered include all existing routes from the T-100 Domestic Market database. Year fixed effects are included. Errors are clustered at the route level. T-statistics are reported in parentheses.

Southwest operates in one endpoint airport in the previous year	0.02
(single presence)	(8.10)
Southwest operates in both endpoint airports in the previous year	0.28
(dual presence)	(32.37)
Observations	79,574

Table 3: The Channel: Entry and Fares

This table presents results from OLS regressions of fares and market share on ***Entry***, a dummy variable that takes value of one when Southwest enters a route and takes value of zero otherwise. Average fares are computed using data from the U.S. Department of Transportation Statistics' Passenger Origin and Destination (OD) Survey, a 10% sample of all airline tickets for U.S. carriers, excluding charter air travel. The dependent variables are average fares on the route (columns 1 and 2), fares charged by the largest carrier operating on the route (columns 3 and 4), fares charged by the lowest fare carrier operating on the route (columns 5 and 6), and market share of the largest carrier operating on the route (columns 7 and 8). Mkt share goes from 1 to 100. "Lowest Fare Carrier" identifies the carrier with the lowest average fare that has at least a 10 percent share of the traffic in the market, except for markets where only a single carrier has a 10 percent or greater share. In such markets the carrier with the lowest average fare is identified even if its market share is less than 10 percent. Observations are at the year-route level. ***Passengers*** is the average number of passengers per day that flew on the route. Average fares are average prices paid by all fare paying passengers. They therefore cover first class fares paid to carriers offering such service but do not cover free tickets, such as those awarded by carriers offering frequent flyer programs. Time and route fixed effects are included and errors are clustered at the route level.

Dependent Variable:	**Fares**						**Mkt Share**	
	Average		Largest Carrier		Lowest Fare Carrier		Largest Carrier	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Entry_{r,t}$	-14.67***	-12.31***	-17.26***	-14.73***	-12.88***	-10.84***	-2.40***	-2.30***
	(-7.79)	(-7.02)	(-7.74)	(-7.01)	(-6.97)	(-6.23)	(-3.85)	(-3.70)
$Passengers_{r,t}$		-0.07***		-0.08***		-0.06***		-0.00***
		(-8.82)		(-8.57)		(-9.02)		(-2.76)
Constant	241.80***	253.43***	240.25***	252.75***	214.73***	224.79***	58.95***	59.43***
	(345.42)	(184.90)	(282.32)	(162.15)	(296.59)	(181.82)	(266.12)	(212.38)
Route Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Observations	75,525	75,525	75,524	75,524	75,524	75,524	75,524	75,524
R-squared	0.849	0.855	0.812	0.819	0.847	0.851	0.851	0.851

Table 4: Threat of Entry and Corporate Debt Maturity

This table presents coefficients obtained running OLS regressions of *Maturity* and *DebtRatio* on $ThreatOfEntry$ and controls. $ThreatOfEntry$ is a dummy variable that takes value of one when Southwest operates at both endpoint airports ***but not yet*** on the route with the highest passengers traffic for airline ***i*** in year ***t*** (columns 1 and 2). Columns from 3 to 10 report, respectively, the effect of $ThreatOfEntry$ on the dependent variables when at least one of the 2, 3, 5 or 10 most profitable routes for airline ***i*** in year ***t*** is under threat. ***Maturity*** is computed as non-current liabilities over total liabilities, ***DebtRatio*** is total liabilities over total assets, ***Size*** is the log of book assets at the beginning of the year, ***ROA*** is earnings over assets in the previous year. Accounting variables are winsorized at the 1% level. Airline and Time fixed effects are included and errors are clustered at the airline level.

Threatened Routes:	**Top 1**		**Top 2**		**Top 3**		**Top 5**		**Top 10**	
Dependent Variable:	Maturity (1)	Debt Ratio (2)	Maturity (3)	Debt Ratio (4)	Maturity (5)	Debt Ratio (6)	Maturity (7)	Debt Ratio (8)	Maturity (9)	Debt Ratio (10)
Threat of Entry$_{i,t}$	0.1326**	0.0509	0.1374***	0.1109	0.1087***	0.0569	0.0593**	0.1531	0.0472*	0.0840
	(2.54)	(0.43)	(3.37)	(0.80)	(3.17)	(0.56)	(2.29)	(1.29)	(1.67)	(0.95)
Size$_{i,t-1}$	0.1141***	-0.0384	0.1143***	-0.0366	0.1125***	-0.0387	0.1116***	-0.0358	0.1116***	-0.0372
	(4.86)	(-0.62)	(4.93)	(-0.59)	(4.84)	(-0.63)	(4.80)	(-0.60)	(4.87)	(-0.62)
ROA$_{i,t-1}$	-0.0060	-0.4760*	-0.0054	-0.4770	-0.0048	-0.4761	-0.0046	-0.4791	-0.0040	-0.4769*
	(-0.18)	(-1.66)	(-0.16)	(-1.66)	(-0.15)	(-1.66)	(-0.14)	(-1.65)	(-0.13)	(-1.66)
Constant	-1.0720***	1.4138	-1.0763***	1.3887	-1.0553***	1.4156	-1.0460***	1.3672	-1.0471***	1.3860
	(-3.52)	(1.59)	(-3.57)	(1.56)	(-3.50)	(1.60)	(-3.46)	(1.59)	(-3.50)	(1.61)
Airline Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	918	918	919	919	919	919	919	919	919	919
R-squared	0.687	0.560	0.688	0.560	0.688	0.560	0.686	0.561	0.686	0.560

Table 5: Robustness

This table presents coefficients obtained running OLS regressions of *Maturity* on *ThreatOfEntry* and controls. *ThreatOfEntry* is a dummy variable that takes value of one when Southwest operates at both endpoint airports but not yet on the route with the ***lowest*** passengers traffic for airline i in year t (column 1). Columns 2 and 3 report respectively the effect of *ThreatOfEntry* when at least one of the five or ten less profitable routes for airline i in year t is under threat. Column 4 reports the effect when at least one of the three routes with highest traffic is under threat. ***Maturity*** is computed as non-current liabilities over total liabilities, ***Size*** is the log of book assets at the beginning of the year, ***Roa*** is earnings over assets in the previous year, *Fuel* is the log of dollar expenses for fuel, ***Cash*** is cash holdings over assets, *log*(***Passengers***) is the natural log of total passengers that travelled with airline i in a given year. Accounting variables are winsorized at the 1% level. Airline and Time fixed effects are included and errors are clustered at the airline level.

	Placebo			**Further Controls**
Threatened Routes:	Bottom 1	Bottom 5	Bottom 10	Top 3
	(1)	(2)	(3)	(4)
Threat of Entry$_{i,t}$	-0.0201	-0.0111	-0.0255	0.0735**
	(-0.51)	(-0.36)	(-0.94)	(2.26)
Size$_{i,t-1}$	0.0800***	0.0932***	0.0943***	0.1303***
	(3.93)	(4.80)	(5.13)	(7.90)
ROA$_{i,t-1}$	0.0782	0.0466	0.0448	0.0149
	(1.36)	(1.03)	(1.10)	(0.48)
Cash$_{i,t-1}$				-0.0681
				(-0.75)
Fuel$_{i,t-1}$				-0.0094
				(-0.64)
log(Passengers$_{i,t}$)				-0.0149*
				(-1.67)
Airline Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y
Observations	918	918	918	728
R-squared	0.648	0.630	0.628	0.740

Table 6: Debt Maturity and Preemption

This table presents coefficients estimated from a probit regression of Southwest's entry into a route in a particular year conditional on previous year financials of the incumbent serving most of the passengers travelling such route. ***Maturity*** is computed as non-current liabilities over total liabilities, ***Size*** is the log of book assets at the beginning of the year, ***ROA*** is earnings over assets in the previous year, ***Fuel*** is the log of dollar expenses for fuel, ***Cash*** is cash holdings over assets, $log(Passengers)$ is the natural log of total passengers that travelled with airline i in a given year. Accounting variables are winsorized at the 1% level. Financials from Southwest are excluded. Year fixed effects are included. Errors are clustered at the route level. T-statistics are reported in parentheses.

Dependent variable:	**Southwest Entry**		
	(1)	(2)	(3)
Maturity$_{i,t-1}$	-0.0022***	-0.0028***	-0.0029***
	(-3.01)	(-3.15)	(-3.26)
Debt Ratio$_{i,t-1}$	0.0043***	0.0038***	0.0041***
	(17.14)	(12.04)	(11.17)
Size$_{i,t-1}$	0.0018***	0.0014***	0.0014***
	(26.13)	(16.17)	(16.02)
log(Passengers$_{i,t-1}$)		0.0012***	0.0012***
		(35.14)	(35.14)
ROA$_{i,t-1}$			0.0017
			(1.41)
Time Fixed Effects	Y	Y	Y
Observations	340,360	275,845	275,110
Pseudo R-squared	0.0435	0.0678	0.0675

Table 7: Carter's Deregulation

This table presents coefficients from difference-in-differences regressions of ***Maturity***, computed as non-current liabilities over total debt, and ***DebtRatio***, computed as total liabilities over total assets, on ***Treatment*** and controls. ***Treatment*** is a dummy variable that takes value of one from 1978 onward for airlines only and is equal to zero otherwise. ***Size*** is the log of lagged book assets, ***ROA*** is the lagged net income over book assets. Only observations from 8 years before until 8 years after the Deregulation act are included. Airlines entering the industry after 1977 are excluded from the sample. The source of the data is Compustat. The control group comprises all Compustat firms operating in the transportation industry (except airlines) in columns from 1 to 4, and all firms in the transportation industry but airlines and trucks in columns from 5 to 8. Accounting variables are winsorized at the 1% level. Airline and time fixed effects are included and errors are clustered at the firm level.

Control group:	**All non-air Transportation**				**No Trucks**			
Dependent Variable:	Maturity (1)	Maturity (2)	Debt Ratio (3)	Debt Ratio (4)	Maturity (5)	Maturity (6)	Debt Ratio (7)	Debt Ratio (8)
$\text{Treatment}_{i,t}$	0.0786***	0.0602**	0.0600	0.0528	0.0805***	0.0602**	0.0632	0.0326
	(2.92)	(2.26)	(1.01)	(1.04)	(3.00)	(2.26)	(1.07)	(0.64)
$\text{Size}_{i,t-1}$		0.0600***		-0.0393		0.0619***		0.0175
		(4.90)		(-0.78)		(5.11)		(0.39)
$\text{ROA}_{i,t-1}$		-0.0365		-0.7429***		-0.0750		-0.7724***
		(-0.73)		(-2.99)		(-1.41)		(-2.94)
Constant	0.4514***	0.0932	0.6701***	1.0085***	0.4649***	0.0915	0.6636***	0.6580**
	(82.11)	(1.25)	(77.59)	(3.18)	(84.08)	(1.21)	(87.51)	(2.25)
Firm Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Observations	10,752	9,574	10,757	9,578	9,912	8,839	9,917	8,843
R-squared	0.767	0.783	0.951	0.568	0.767	0.784	0.958	0.587

Table 8: Alternative proxies of Maturity

This table presents coefficients from difference-in-differences regressions of ***Maturity*** on ***Treatment*** and controls for the Deregulation Experiment. Different proxies of maturity are considered: long-term debt maturing in more than 2, 3, 4, or 5 years and newly issued long-term debt (scaled by total debt). ***Treatment*** is a dummy variable that takes value of one from 1978 onward for airlines and is equal to zero otherwise. ***Size*** is the log of lagged book assets, ***ROA*** is the lagged net income over book assets. Only observations from 8 years before until 8 years after the Deregulation law was passed are included. Airlines entering the industry after 1977 are excluded from the sample. The source of the data is Compustat. The control group comprises all Compustat firms operating in the transportation industry (except airlines) Accounting variables are winsorized at the 1% level. Airline and Time fixed effects are included and errors are corrected for heteroskedasticity and clustered at the firm level.

Dependent Variable:	Proportion of Long-term debt maturing in more than:				
	2 years	3 years	4 years	5 years	new issues
	(1)	(2)	(3)	(4)	(5)
Treatment$_{i,t}$	0.0598**	0.0637***	0.0628***	0.0606***	0.0777***
	(2.36)	(2.80)	(3.06)	(3.07)	(3.87)
Size$_{i,t-1}$	0.0656***	0.0663***	0.0643***	0.0654***	-0.0190**
	(5.07)	(5.33)	(5.17)	(5.60)	(-2.24)
ROA$_{i,t-1}$	-0.1219*	-0.1568**	-0.1408**	-0.1140*	0.1262**
	(-1.70)	(-2.29)	(-2.11)	(-1.72)	(2.49)
Constant	0.0212	-0.0141	-0.0389	-0.0814	0.1834***
	(0.26)	(-0.18)	(-0.50)	(-1.11)	(3.57)
Firm Fixed Effects	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y
Observations	6,576	6,569	6,558	6,531	8,944
R-squared	0.838	0.846	0.851	0.857	0.446

Table 9: No Actual Entry

This table presents coefficients obtained running OLS regressions of ***Maturity*** and ***DebtRatio*** on $ThreatOfEntry$ and controls. $ThreatOfEntry$ is a dummy variable that takes value of one when Southwest threatens at least one of the top k routes (in terms of passenger traffic) for airline i requiring additionally that Southwest did not enter in any of them. k is equal either to 2, 3, 5 or 10. A route is defined as threatened when Southwest operates at both endpoint airports. ***Maturity*** is computed as non-current liabilities over total liabilities, ***DebtRatio*** is total liabilities over total assets, ***Size*** is the log of book assets at the beginning of the year, ***ROA*** is earnings over assets in the previous year. Accounting variables are winsorized at the 1% level. Financials from Southwest are excluded. Airline and Time fixed effects are included and errors are clustered at the airline level.

Threatened Routes:	**Top 2**		**Top 3**		**Top 5**		**Top 10**	
Dependent Variable:	Maturity (1)	Debt Ratio (2)	Maturity (3)	Debt Ratio (4)	Maturity (5)	Debt Ratio (6)	Maturity (7)	Debt Ratio (8)
Threat of Entry$_{i,t}$	0.1367***	0.1152	0.1085***	0.0684	0.0655**	0.1522	0.0402	0.0957
	(3.34)	(0.82)	(3.11)	(0.67)	(2.24)	(1.14)	(1.47)	(0.89)
Size$_{i,t-1}$	0.1156***	-0.0344	0.1135***	-0.0368	0.1133***	-0.0310	0.1153***	-0.0281
	(4.93)	(-0.55)	(4.80)	(-0.59)	(4.82)	(-0.50)	(9.22)	(-0.41)
ROA$_{i,t-1}$	-0.0085	-0.4751	-0.0076	-0.4729	0.0039	-0.3570	-0.0041	-0.3522
	(-0.26)	(-1.65)	(-0.23)	(-1.65)	(0.12)	(-1.44)	(-0.13)	(-1.37)
Constant	-1.0889***	1.3196	-1.0693***	1.3567	-1.0619***	1.2450	-1.0719***	1.2207
	(-3.57)	(1.46)	(-3.46)	(1.50)	(-3.43)	(1.38)	(-6.46)	(1.23)
Airline Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Observations	889	889	877	877	862	862	827	827
R-squared	0.692	0.568	0.691	0.566	0.690	0.576	0.697	0.584

Table 10: Average incumbents' financials

This table presents coefficients estimated from a probit regression for Southwest's entry into a route in a particular year conditional on previous year average financials of the incumbents. *Maturity* is computed as non-current liabilities over total liabilities, *Size* is the log of book assets at the beginning of the year, *ROA* is earnings over assets in the previous year, *Fuel* is the log of dollar expenses for fuel, *Cash* is cash holdings over assets, *log*(*Passengers*) is the natural log of total passengers that travelled with airline *i* in a given year. Accounting variables are winsorized at the 1% level. Financials from Southwest are excluded. Year fixed effects are included. Errors are clustered at the route level. T-statistics are reported in parentheses.

Dependent variable:	**Southwest Entry**		
	(1)	(2)	(3)
$\text{Maturity}_{r,t-1}$	-0.0042***	-0.0062***	-0.0063***
	(-5.29)	(-5.62)	(-5.62)
$\text{Debt Ratio}_{i,t-1}$	0.0058***	0.0057***	0.0057***
	(21.81)	(15.43)	(15.35)
$\text{Size}_{r,t-1}$	0.0022***	0.0024***	0.0024***
	(28.71)	(22.01)	(21.81)
$\log(\text{Passengers}_{t-1})$		0.0011***	0.0011***
		(27.75)	(27.67)
$\text{ROA}_{r,t-1}$			0.0000**
			(2.35)
Time Fixed Effects	Y	Y	Y
Observations	369,791	306,890	305,754
Pseudo R-squared	0.0435	0.0678	0.0675

Table 11: Private versus Public

This table presents coefficients obtained running OLS regressions of *Maturity* and *DebtRatio* on *ThreatOfEntry* and controls. *ThreatOfEntry* is a dummy variable that takes value of one when Southwest operates at both endpoint airports but not yet on any of the three routes with the highest passengers traffic for airline i in year t. The sample is split in *Private*, i.e., airlines that are privately held and *Public*, i.e., airlines that are publicly held. *Maturity* is computed as non-current liabilities over total liabilities, *Size* is the log of book assets at the beginning of the year, *Roa* is earnings over assets in the previous year. Accounting variables are winsorized at the 1% level. Financials from Southwest are excluded. Airline and Time fixed effects are included and errors are clustered at the airline level.

Dep. Variable	**Maturity**		**Debt Ratio**	
Ownership	Private	Public	Private	Public
	(1)	(2)	(3)	(4)
Threat of Entry$_{i,t}$	0.1367***	0.0787	0.1361	0.0552
	(3.06)	(1.56)	(0.84)	(0.46)
Size$_{i,t-1}$	0.1106***	0.1587***	-0.0476	0.0201
	(3.36)	(5.42)	(-0.41)	(0.46)
Roa$_{i,t-1}$	0.0034	-0.0218	-0.3548	-0.9677**
	(0.09)	(-0.43)	(-1.24)	(-2.06)
Constant	-0.9536**	-1.7872***	1.5527	0.4678
	(-2.55)	(-4.14)	(1.01)	(0.74)
Airline Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y
Observations	475	402	475	402
R-squared	0.699	0.706	0.552	0.650

A Appendix

Table A.1: Summary statistics for Carter's Deregulation Experiment

This table presents summary statistics for the Deregulation Experiment. *Treatment* identifies airlines operating in the industry since before 1978. The control group includes all non-air transportation firms. The sample goes from 1972 to 1984.

	Treatment group (1)	Control group (2)	Difference (3)	t-stats (4)
$\text{Size}_{i,t}$	661	705	-44	-0.56
$\text{Roa}_{i,t}$	0.115	0.119	-0.004	-0.59
$\text{Cash Flows}_{i,t}$	0.108	0.106	0.002	0.19
$\text{Maturity}_{i,t}$	0.494	0.407	0.087	8.24***